

# Design and Implementation of Smart Monitoring Systems in Hospital Wagon using IoT Technology: A Case Study

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## ABSTRACT

Nowadays, many researchers are contributing their research in the field of Internet of things (IoT), since it is important and attractive technology. IoT means communication between human to device or device to device, anywhere in real time. This communication takes place with the help of different smart sensors which are connected via internet. In the IoT infrastructure different sensors can sense, analyse, transmit and store all the data on cloud. This paper presents a wearable sensor network system for Internet of Things (IoT) connected safety and health applications. The wearable sensors on different subjects can communicate with each other and transmit the data to a gateway via a Local Area Network which forms a heterogeneous IoT platform with wifi-based medical signal sensing network. It consists of two sections: the basic information and condition of patient is collected in the wagon by the means IoT (Internet of Things) and make it available to hospital before the emergency vehicle reaches the hospital. On the base of such data, the system is able to detect anomalous situations and provide information about the status directly and exclusively to the hospital. The second path is control of traffic lights from the wagon and makes free for its path automatically. This project is to save the time of major late time aspects in more efficient manner and save the life.

**KEYWORDS:** *Datas on cloud, Wearable sensors, wife*

## I. INTRODUCTION

We cannot imagine our life without internet because Internet has an impact on our day to day life. IOT enabled things will provide the current status of surrounding atmosphere or the condition of "things" and notify to the users [1]. The role of existing Wagon – emergency service has shown a significant change in the death rate due to accidents. Most of the people died are from rural areas because they are not able to reach the hospital in right time. Otherwise they did not get proper treatment due to unavailability of doctor, lack of information and inadequate services. The mortality rate of accident due to delay of the wagon and inadequate medical information. To overcome this situation we designed this project to enhance the life time of the every human being by reducing the delay of wagon and prior information of the hospital. Utilization of modern technology to overcome the delay in timely service and communication of information to the respective experts & facilitators to enhance the process of saving the lives of the patients. The proposed method monitors the patient health parameters and provide automated response of the measured details from the patient's treatment can be prepared before handedly. The generation of shortest route to nearby hospital, and the clearance of traffic signal along the path to reach the hospital is also possible.

Emergency cases [2] like heart attack, accidents, pregnancy, fever, unconscious, paralysis, inflation and all types of

**How to cite this paper:** Mrs. S. Kirthica | Mrs. S. Priyadharsini "Design and Implementation of Smart Monitoring Systems in Hospital Wagon using IoT Technology: A Case Study" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-5, August 2020, pp.17-20, URL: [www.ijtsrd.com/papers/ijtsrd31731.pdf](http://www.ijtsrd.com/papers/ijtsrd31731.pdf)



IJTSRD31731

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emergencies are handled by hospital wagon services. The hospital wagon can reach the site and rush the victim to the nearest hospital within 20 minutes in urban areas and 40 minutes in rural areas, approximately. This services works on the paradigm of Sense, Reach and Care supported by an efficiently trained team and state of the art equipment & software with GPS tracking systems [3]. The system is fully automated using WIFI technology this technology appears as a promising solutions for IoT applications because of its effective transmission, coverage of areas, low power consumption and more number of end devices connected to gateways using a single hop. However, although novel healthcare services are expected to reduce costs and increase the quality of life of users, the more data organizations collect, from both fixed and mobile medical monitoring services, the more difficult is the effective use of a Cloud-based infrastructure from the local to the Cloud. The objective of this review paper is to highlight the significant research area of IOT in the form of case study of the application of IOT.

## II. SMART HEALTH

Now a day IOT based smart health system is very popular concept. In this system, patients can communicate with doctor using devices having internet facility. This health care consists of software and devices to detect and analyse the health problem. Also proposed system will store all the

medical records of patients [4]. Various sensors are attached to the human body to monitor and control the physical parameters like BP Monitor, Glucose Monitor, ECG Monitor etc [5]. In IOT based health care system physiological parameters of patients will be captured and analyse the patient's health issue, then these information will be passed to doctor using secure wireless channel. So that doctor can make appropriate smart health recommendations [6].

### SERVICES UNDER SMART HEALTH

**Smart medicine:** In case of emergency a primary care could be handled efficiently using smart medicine. The patient who is in the remote location treated by doctor.

**Smart monitoring:** A patient's data collected and transmitted using health monitoring system for remote testing and diagnosis using IOT. This is also called e-monitoring services, which consists of SMS alerts or emergency calling to patient's relatives, doctors and caretakers (Fig.1).

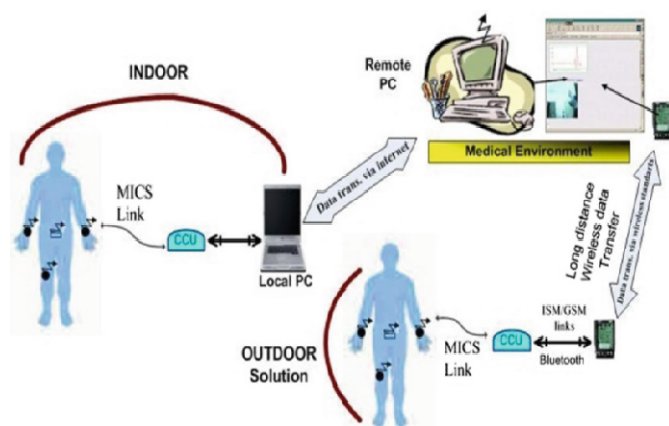


Fig.1. Smart healthcare (Source: <https://ecse.monash.edu/staff/mehmet/WBSN>)

### Smart surgery:

In this service, the surgeon can perform an operation on a patient from a distant location using robotics technology or video conferencing. This system can be supported by IOT technology.

### Remote medical education:

The main cause of bad health issue is maximum people don't have access of good medical facilities and continuous monitoring in case of critical health situation. Medical facilities and continuous monitoring in case of critical health situation. Medical education is provided to the community or targeted groups from a geographically different location using the IOT system [7].

### III. PROPOSED SMART LIFE SAVER AMBULANCE SYSTEM (SLSAS)

Proposed smart ambulance system aims at drastically reducing the deaths due to highway accidents, it ensures that the ambulance arrives in time by informing the nearby hospital automatically and hence smart ambulance which has the needed portable equipment's furnished net connection to push the data to the doctor's admin page with IOT connectivity.

There are basically two modules in this smart ambulance system, i.e; vehicle module which is placed in the patient's vehicle GSM and GPS enabled devices and receiver module

which is a mobile phone to receive short message service of the accident location to the nearby hospital for ambulance service.

The results followed are classified into two main categories i.e; firstly, occurrence of accident information detected using vibration sensor and location is shared using GPS enabled module in the passenger's vehicle privately. Secondly smart hospital wagon arrives and the victims personal and basic health details needed to test for the patient's treatment is informed to the appropriate hospital using IOT furnished technology enabled in the smart ambulance. The readily available patients basic and health details are reflected to the assigned doctor even before the patient arrive the hospital for their treatment.

The needed modules are Global Positioning System – GPS for accident location information, GSM transmitter and receiver, vibration sensing for accident detection, Microcontroller-ESP8266EX as a processing unit, personal computer (PC) as a database for ambulance service. The overall system architecture for smart ambulance system is in Fig.2

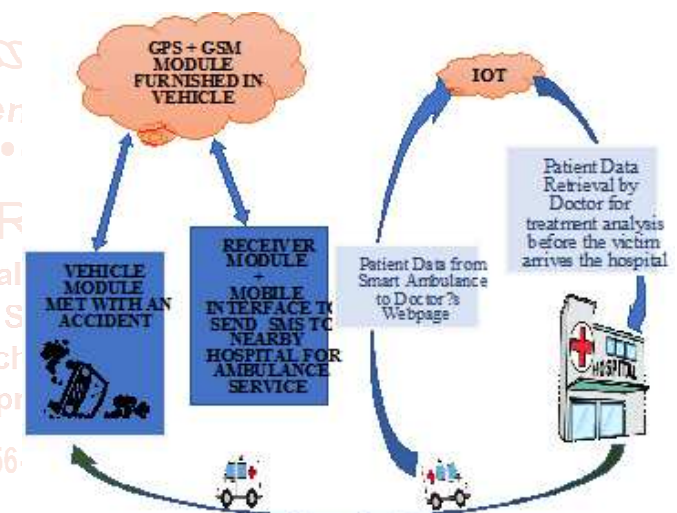


Fig.2. System Architectural visualization for Smart Ambulance System

### Intimation to nearby hospital about the accident location:

Two mobile phones are used here as transmitter and receiver. The mobile in the vehicle module acts as the transmitter to transmit the information to the receiver. The receiver is again a mobile which is interfaced to PC. The PC is used for integrating the Auto-Dialler to call the ambulance service nearer to the accident location. The accident location is informed to the hospital or ambulance service by voice. The whole process goes on without any human intervention [8]. AT- Attention (Modem control commands) are used to initialize the communication in terms of short location information to the nearby hospital for ambulance service.

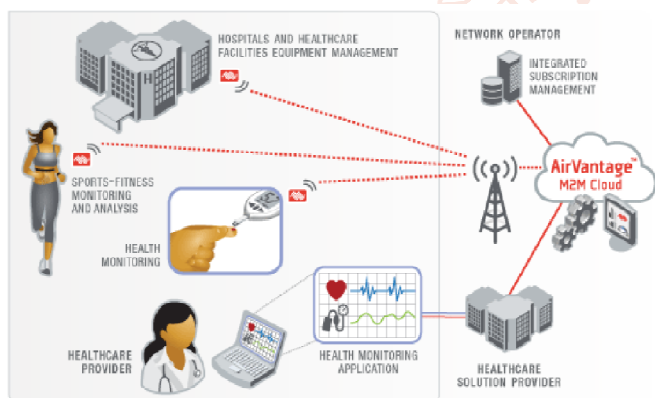
### IV. HEALTH CARE AND INTERNET OF THINGS

Advances in information, telecommunication, and network technologies play a significant role in health care systems and have contribution in development of medical information systems. However, health care represents one of the important social and economic challenges that every country faces, and health care administrators, clinicians, researchers, and other health practitioners are facing increasing pressure to adjust to growing expectations from both the public and the private sector.

A major impact on the quality of people's life is the rising cost of medical care and these costs are even higher in the case of chronic diseases [9]. The number of elderly is increasing continuously, which puts pressure on social and health services [10].

The development of health care systems demands a concerted effort to harness the power of information and communications technologies in the service of health care in order to create more efficient, effective, and secure data sharing, large-scale health information processing, and more effective communications [11].

A number of connected devices have been developed to improve health care delivery using sensors to collect information and cloud hosted analytics software that analyses data. Over the past 10-15 years, health care providers have increasingly become connected through the use of mobile computers, tablets, PCs, smartphones, Wi-Fi phones, and communications badges [12] and help them to become far more proactive about Health Services Delivery. The illustration from Sierra Wireless [13], showed in Fig. 1, describes how a health care provider could theoretically use real time data collected from hospitals, wearable devices, home health monitoring devices, and elsewhere to provide better services [12].



**Fig.3. Real time monitoring of patient health through IOT [13]**

Many patients who require constant health monitoring prefer the comfort of home monitoring to hospital environment. In case of remote monitoring patients can use a variety of monitoring devices such as glucose meters, pulse oxymeters, weight scales etc. The main difficulty in home monitoring is making patients to provide accurate data to health care specialists. A number of require close observation and need constant attention or special drugs because they may have suffered serious injuries or they may have recently suffered major surgery.

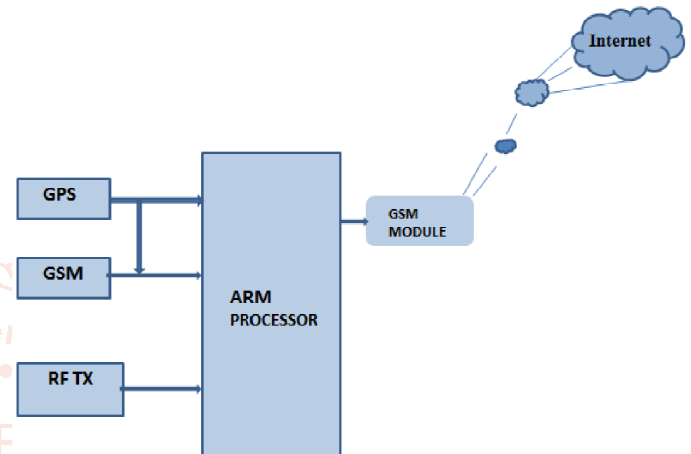
companies are developing further connectivity solutions to improve not only communications between health care givers and patients, but real time monitoring of patient health as well [12], [14].

The problems of the Romanian Health System are similar to those of other European countries. In present, Romanian medical sector has not fully embraced the advantages and benefits of recent technologies that are used in health care sector. For instance, the medical staff has to deal with

amounts of patient's medical records. The health care services costs are expected to grow due to the aging of the population and the increasing demand on health systems [10].

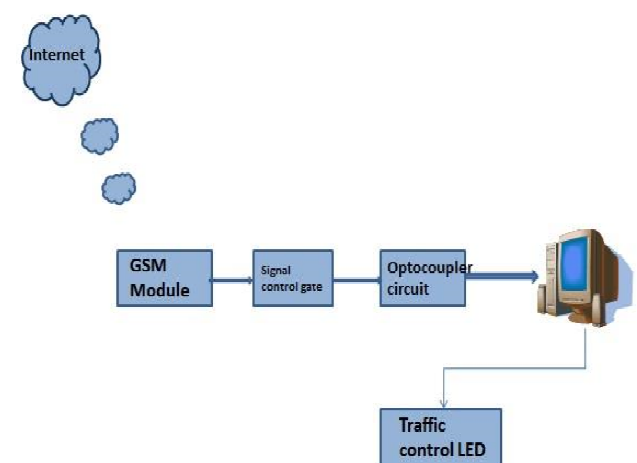
The new health care systems support the doctors and elderly people or patients with chronic diseases in managing the health care process in order to achieve an optimal health status or to avoid a worsening of the illness as long as possible. Recent evolution in health care domain has consistently shown that combined technologies have the possibility to resolve particular problems of the health domain.

## V. BLOCK DIAGRAM



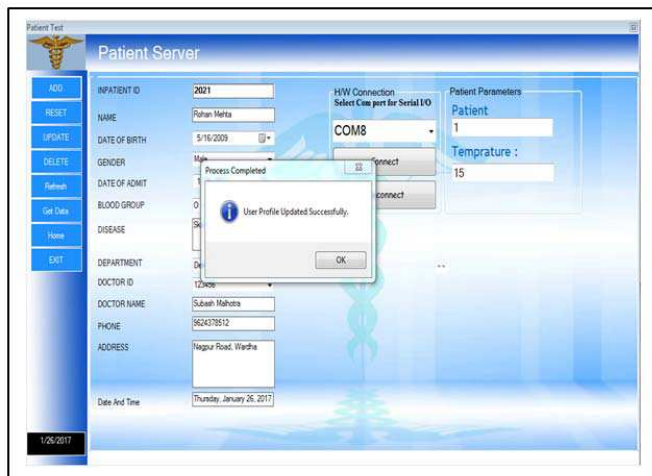
**Fig.4. Block diagram of ambulance (Hospital Wagon) part**

The above figure describes about the ambulance part which is placed within in the ambulance so ambulance driver can access this device through GPS driver traces the location and send the location updates to traffic control management and GPS I connected to the ARM processor and GSM module because to send the message to traffic management and also to get the acknowledgements from the receiver side and this communication should takes place with the high security and information is encrypted and this process is carried away by the internet of things and through IoT information can be sent without delaying the time. The figure 5 illustrates through IoT information is sent to signal logic gate by GSM module and by using Optocoupler circuit all the information is passed and control by PC and through PC controlling of Traffic [15,16] Control LED takes place as shown in figure5



**Fig.5. Block diagram of traffic control management side**





**Fig.6. [Patient Server]**

## VI. CONCLUSION

The internet has immediately changed the way we live, intercommunicating between people at a virtual level in several contexts spanning from professional life to social relationships. The IoT has the potentiality to add a new dimension to this process by establishing communication among smart objects, leading to the vision of anytime, anywhere, any media, anything communication. Ingenious use of IoT technology in healthcare not only benefits to doctors and managers to access wide ranges of data sources but also challenges in a mobile environment of real-time IoT application systems.

Considering the population status and the majority of the people live in villages which are remote places and with the growing technology and more importantly healthcare being the predominant issue of the nation this smart healthcare system using IoT technology plays an important monitoring tool at levels in the larger interest of the global as a whole.

## VII. ACKNOWLEDGEMENT

I would like to acknowledge my indebtedness and sincere gratitude to my guide for his invaluable guidance during my dissertation work and my family for the encouragement, support and kind co-operation. And all the staff members of Electronics and Communication Department. And also Arasu Engineering College for providing me excellent atmosphere for dissertation work.

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